

IN THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the present application:

1. (Currently Amended) A method of operating a destination storage server to mirror a primary volume maintained by a source storage server, the method comprising:

receiving, at the destination storage server, a plurality of log entries from the source storage server, the plurality of log entries representing write requests received by the source storage server;

writing the received log entries to a file ~~at a mirror site~~ maintained by the destination storage server;

receiving, at the destination storage server, data from the source storage server at during a synchronization phase of a consistency point, the consistency point being one of a plurality of regularly occurring consistency points, each characterized by the saving of data specified by write requests in a set of non-volatile storage devices managed by a RAID layer in the source storage server and in a set of non-volatile storage devices managed by a RAID layer in the destination storage server, wherein said data received at the destination storage server from the source storage server during the synchronization phase of the consistency point include volume block number updates from the source storage server;

using the data received at the destination storage server from the source storage server during the synchronization phase of the consistency point, including the volume block number updates, to update a mirror volume ~~at the mirror site~~ maintained by the destination storage server, via ~~a storage access~~ the RAID layer in the destination storage server; and

using log entries from the file to update the mirror volume.

2-3. (Canceled)

4. (Currently Amended) A method as recited in claim 3¹, wherein said receiving the data from the source storage server comprises receiving the data via TCP/IP.

5. (Original) A method as recited in claim 1, wherein said using log entries from the file to update the mirror volume is done at the consistency point in conjunction with said using the data to update the mirror volume.

6. (Original) A method as recited in claim 1, wherein said using log entries from the file to update the mirror volume is done in response to a failure that renders the primary volume inaccessible.

7. (Currently Amended) A method of mirroring data, the method comprising:

at a source storage server, receiving a plurality of write requests from a set of clients;

creating log entries for the write requests in the source storage server;

transmitting the log entries to a destination storage server at a mirror site;

writing the log entries to a file corresponding to the source storage server in the destination storage server; and

at a consistency point of a plurality of regularly occurring consistency points,

causing a primary volume implemented in a set of non-volatile storage devices maintained by a RAID layer in the source storage server to be updated based on the write requests, and

during a synchronization phase of the consistency point, causing a mirror volume implemented in a set of non-volatile storage devices maintained by a RAID layer in the destination storage server at the mirror site to be updated to reflect the updated primary volume, by

transmitting consistency point data from the source storage server to the destination storage server, the consistency point data including volume block number updates from the source storage server,

receiving the consistency point data at the destination storage server,
updating the mirror volume through ~~a storage access software~~ the RAID
layer ~~on~~ in the destination storage server based on the received consistency point data, and
using log entries from the file to update the mirror volume.

8-9. (Canceled)

10. (Original) A method as recited in claim 7, wherein said receiving the consistency point data at the destination storage server comprises receiving the consistency point data via TCP/IP.

11. (Original) A method as recited in claim 7, wherein said using log entries from the file to update the mirror volume is done at the consistency point in conjunction with said using the consistency point data to update the mirror volume.

12. (Original) A method as recited in claim 7, wherein said using log entries from the file to update the mirror volume is done in response to a failure that renders the primary volume inaccessible.

13. (Currently Amended) A method of mirroring data, the method comprising:

performing a log forwarding process that includes

at a source file server, receiving a plurality of write requests from a set of clients,

creating a log entry for each of the write requests in a nonvolatile memory in the source file server,

transmitting the log entry for each of the write requests to a destination file server at a mirror site, and

writing the log entry to a file of log entries corresponding to the source file server in the destination file server;

at a consistency point of a plurality of regularly occurring consistency points, performing a data synchronization process that includes

causing a RAID primary volume implemented in a set of disks maintained by the source file server to be updated based on the write requests, by communicating through a RAID software layer ~~on~~in the source file server, and

causing a RAID mirror volume implemented in a set of disks maintained by the destination file server at the mirror site to be updated to reflect the updated RAID primary volume, by

transmitting consistency point data from the source file server to the destination file server ~~using a protocol at a higher logical level than RAID~~, the consistency point data including volume block number updates from the source file server.

receiving the consistency point data at the destination file server, and

updating the RAID mirror volume through a RAID software layer ~~on~~in the destination file server based on the received consistency point data; and

using log entries from the file to update the RAID mirror volume.

14. (Currently Amended) A method as recited in claim 13, wherein said transmitting consistency point data from the source file server to the destination file server ~~using a protocol at a higher logical level than RAID~~ comprises transmitting the consistency point data from the source file server to the destination file server using TCP/IP.

15. (Original) A method as recited in claim 13, wherein said using log entries from the file to update the RAID mirror volume is done at the consistency point in conjunction with updating the RAID mirror volume based on the received consistency point data.

16. (Original) A method as recited in claim 13, wherein said using log entries from the file to update the mirror volume is done in response to a failure that renders the primary volume inaccessible.

17. (Currently Amended) A storage server comprising:

a network interface to communicate with a remote storage server;

a ~~storage-access~~RAID layer to maintain a mirror volume of data reflecting a primary volume of data maintained by the remote storage server;

a file system to receive a plurality of log entries from the remote storage server, the log entries representing write requests received by the remote storage server from a set of clients, wherein the file system layer further is to write the log entries to a file and, in the event of a failure, to use the file update a mirror volume of the primary volume; and

a network administration unit to receive consistency point data from the remote storage server at ~~the~~a consistency point of a plurality of regularly occurring consistency points, and each consistency point characterized by the saving of data specified by write requests in a set of non-volatile storage devices managed by the RAID layer in the storage server and in a set of non-volatile storage devices managed by a RAID layer in the remote storage server, wherein the received consistency point data include volume block number updates from the remote storage server, the network administration unit further to respond to the received consistency point data by causing the ~~storage-access~~RAID layer to use the consistency point data to update the mirror volume.

18. (Canceled)

19. (Original) A storage server as recited in claim 17, wherein the network administration unit is at the same logical level as the file system layer.

20. (Canceled)

21. (Currently Amended) A method as recited in claim ~~20~~ 17, wherein the consistency point data is received from the remote storage server via TCP/IP.

22. (Original) A method as recited in claim 17, wherein the file system uses the file to update the mirror volume at the consistency point in conjunction with using the consistency point data to update the mirror volume.

23. (Original) A method as recited in claim 17, wherein the file system uses the file to update the mirror volume in response to a failure that renders the primary volume inaccessible.

24. (Currently Amended) An apparatus for mirroring data, the apparatus comprising:

means for receiving a plurality of log entries from a remote storage server, the plurality of log entries representing write requests received by the remote storage server;

means for writing the log entries to a file;

means for receiving consistency point data from the remote storage server at a consistency point of a plurality of regularly occurring consistency points, each consistency point characterized by the saving of data specified by write requests in a set of non-volatile storage devices managed by a RAID layer in a local storage server and in a set of non-volatile storage devices managed by a RAID layer in the remote storage server, wherein the received consistency point data include volume block number updates from the remote storage server,

means for using the consistency point data, including the volume block number updates,
to update a mirror volume through ~~a local storage access~~ the RAID software layer in the local
storage server, and

means for using the log entries in the file to update the mirror volume.

25. (Canceled)